



Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 12:54 PM GMT

PDB ID : 1L14
Title : CONTRIBUTIONS OF HYDROGEN BONDS OF THR 157 TO THE THERMODYNAMIC STABILITY OF PHAGE T4 LYSOZYME
Authors : Dao-Pin, S.; Alber, T.; Matthews, B.W.
Deposited on : 1988-02-05
Resolution : 1.70 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

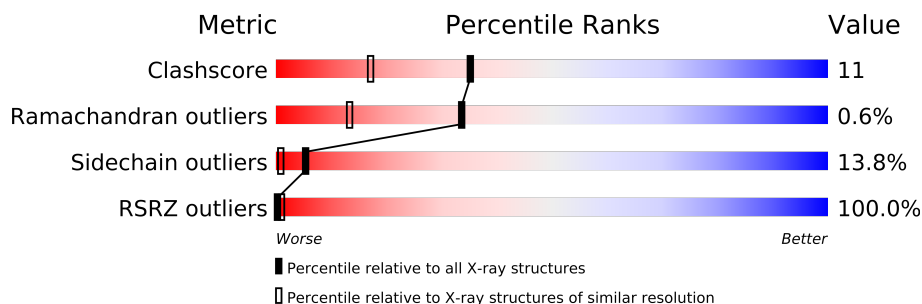
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 1.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	79885	2929 (1.70-1.70)
Ramachandran outliers	78287	2878 (1.70-1.70)
Sidechain outliers	78261	2878 (1.70-1.70)
RSRZ outliers	66119	2456 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	164	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1426 atoms, of which 0 are hydrogen and 0 are deuterium.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called T4 LYSOZYME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	164	Total	C	N	O	S	0	0	0
			1308	822	238	241	7			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	157	SER	THR	CONFLICT	UNP P00720

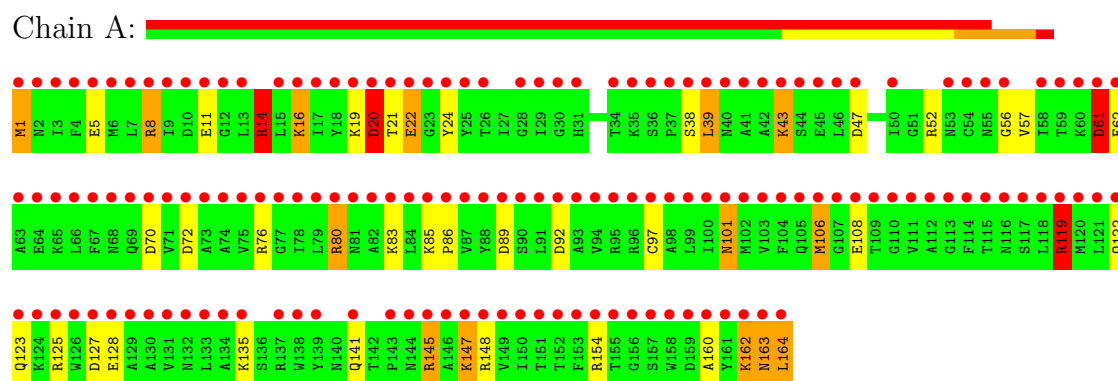
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	118	Total	O	0	0
			118	118		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($\text{RSRZ} > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: T4 LYSOZYME



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	61.20Å 61.20Å 97.10Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	6.00 – 1.70 20.03 – 1.70	Depositor EDS
% Data completeness (in resolution range)	(Not available) (6.00-1.70) 68.8 (20.03-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	122350.00 (at 1.70Å)	Xtriage
Refinement program	TNT	Depositor
R, R_{free}	0.176 , (Not available) 0.172 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	17.7	Xtriage
Anisotropy	0.101	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.52 , 138.6	EDS
Estimated twinning fraction	0.036 for -h,-k,l	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	1 of 16232 reflections (0.006%)	Xtriage
F_o, F_c correlation	0.47	EDS
Total number of atoms	1426	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.93% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	1.13	5/1328 (0.4%)	1.47	26/1786 (1.5%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	128	GLU	CD-OE2	7.84	1.34	1.25
1	A	108	GLU	CD-OE2	6.46	1.32	1.25
1	A	11	GLU	CD-OE1	-6.23	1.18	1.25
1	A	62	GLU	CD-OE2	5.81	1.32	1.25
1	A	22	GLU	CD-OE2	5.03	1.31	1.25

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	119	ARG	NE-CZ-NH1	11.75	126.18	120.30
1	A	8	ARG	NE-CZ-NH2	-10.61	115.00	120.30
1	A	20	ASP	CB-CG-OD2	-8.87	110.32	118.30
1	A	20	ASP	CB-CG-OD1	8.57	126.02	118.30
1	A	80	ARG	NE-CZ-NH1	7.90	124.25	120.30
1	A	14	ARG	NE-CZ-NH1	7.76	124.18	120.30
1	A	127	ASP	CB-CG-OD1	7.58	125.12	118.30
1	A	70	ASP	CB-CG-OD1	7.29	124.86	118.30
1	A	72	ASP	CB-CG-OD1	6.79	124.41	118.30
1	A	145	ARG	NE-CZ-NH1	-6.57	117.01	120.30
1	A	119	ARG	NE-CZ-NH2	-6.57	117.02	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	70	ASP	CB-CG-OD2	-6.41	112.53	118.30
1	A	76	ARG	NE-CZ-NH2	-6.12	117.24	120.30
1	A	92	ASP	CB-CG-OD1	6.11	123.80	118.30
1	A	22	GLU	CA-CB-CG	-5.93	100.36	113.40
1	A	80	ARG	NE-CZ-NH2	-5.86	117.37	120.30
1	A	47	ASP	CB-CG-OD2	-5.85	113.03	118.30
1	A	92	ASP	CB-CG-OD2	-5.76	113.12	118.30
1	A	14	ARG	NE-CZ-NH2	-5.69	117.45	120.30
1	A	162	LYS	CB-CA-C	-5.56	99.28	110.40
1	A	20	ASP	CB-CA-C	-5.46	99.47	110.40
1	A	154	ARG	NE-CZ-NH2	-5.31	117.65	120.30
1	A	61	ASP	CB-CG-OD2	-5.20	113.62	118.30
1	A	19	LYS	C-N-CA	5.20	134.70	121.70
1	A	163	ASN	CA-CB-CG	-5.13	102.10	113.40
1	A	61	ASP	CA-CB-CG	-5.10	102.19	113.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	61	ASP	Sidechain

5.2 Close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1308	0	1332	28	1
2	A	118	0	0	3	1
All	All	1426	0	1332	28	1

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 11.

All (28) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:20:ASP:HB2	1:A:24:TYR:H	1.27	0.97
1:A:20:ASP:HB3	1:A:22:GLU:H	1.28	0.96
1:A:148:ARG:HD3	1:A:164:LEU:CD2	2.07	0.84
1:A:20:ASP:HB3	1:A:22:GLU:N	1.99	0.77
1:A:148:ARG:HD3	1:A:164:LEU:HD23	1.70	0.72
1:A:20:ASP:HB2	1:A:24:TYR:N	2.03	0.71
1:A:148:ARG:HD3	1:A:164:LEU:HD21	1.74	0.69
1:A:164:LEU:N	1:A:164:LEU:HD13	2.11	0.66
1:A:52:ARG:HG3	1:A:52:ARG:HH11	1.61	0.65
1:A:119:ARG:HH11	1:A:119:ARG:HB3	1.63	0.64
1:A:80:ARG:NH2	2:A:277:HOH:O	2.30	0.64
1:A:97:CYS:SG	2:A:213:HOH:O	2.57	0.59
1:A:164:LEU:N	1:A:164:LEU:CD1	2.72	0.53
1:A:1:MET:HA	1:A:5:GLU:OE1	2.10	0.52
1:A:39:LEU:HD13	1:A:43:LYS:HE2	1.90	0.52
1:A:148:ARG:CD	1:A:164:LEU:HD23	2.40	0.51
1:A:52:ARG:HG3	1:A:52:ARG:NH1	2.24	0.50
1:A:123:GLN:HE21	1:A:125:ARG:HD2	1.77	0.50
1:A:85:LYS:N	1:A:86:PRO:HD2	2.27	0.50
1:A:160:ALA:O	1:A:164:LEU:HD22	2.12	0.49
1:A:57:VAL:HG13	2:A:201:HOH:O	2.15	0.46
1:A:21:THR:HG22	1:A:21:THR:O	2.16	0.45
1:A:85:LYS:NZ	1:A:89:ASP:OD1	2.46	0.44
1:A:101:ASN:ND2	1:A:145:ARG:HH21	2.17	0.43
1:A:163:ASN:O	1:A:164:LEU:OXT	2.38	0.42
1:A:147:LYS:HE3	1:A:147:LYS:HB3	1.44	0.41
1:A:106:MET:HE3	1:A:106:MET:HB3	1.42	0.41
1:A:16:LYS:HE2	1:A:56:GLY:O	2.22	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:14:ARG:NE	2:A:268:HOH:O[4_655]	2.18	0.02

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	162/164 (99%)	159 (98%)	2 (1%)	1 (1%)	33	13

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	20	ASP

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	138/138 (100%)	119 (86%)	19 (14%)	5	1

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	8	ARG
1	A	14	ARG
1	A	16	LYS
1	A	20	ASP
1	A	38	SER
1	A	39	LEU
1	A	43	LYS
1	A	61	ASP
1	A	83	LYS
1	A	101	ASN
1	A	106	MET
1	A	119	ARG
1	A	122	GLN
1	A	135	LYS
1	A	141	GLN
1	A	147	LYS
1	A	162	LYS
1	A	164	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	68	ASN
1	A	101	ASN
1	A	123	GLN
1	A	144	ASN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	152/164 (92%)	12.14	152 (100%) 0 1	10, 21, 38, 67	0

All (152) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	58	ILE	63.7
1	A	153	PHE	42.7
1	A	111	VAL	36.7
1	A	126	TRP	26.6
1	A	26	THR	24.7
1	A	118	LEU	24.6
1	A	84	LEU	22.5
1	A	86	PRO	22.3
1	A	39	LEU	22.0
1	A	25	TYR	21.5
1	A	17	ILE	21.4
1	A	103	VAL	21.1
1	A	97	CYS	19.5
1	A	115	THR	19.4
1	A	131	VAL	19.2
1	A	82	ALA	18.7
1	A	71	VAL	18.5
1	A	78	ILE	18.4
1	A	112	ALA	18.2
1	A	129	ALA	18.0
1	A	36	SER	17.8
1	A	149	VAL	17.7
1	A	43	LYS	17.6
1	A	37	PRO	17.1
1	A	15	LEU	16.9
1	A	164	LEU	16.8
1	A	117	SER	16.6

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Mol	Chain	Res	Type	RSRZ
1	A	38	SER	16.5
1	A	109	THR	16.4
1	A	18	TYR	16.2
1	A	24	TYR	16.1
1	A	41	ALA	16.1
1	A	102	MET	15.9
1	A	121	LEU	15.9
1	A	34	THR	15.8
1	A	114	PHE	15.5
1	A	98	ALA	15.2
1	A	130	ALA	15.2
1	A	54	CYS	15.1
1	A	75	VAL	15.0
1	A	35	LYS	15.0
1	A	116	ASN	14.4
1	A	12	GLY	14.3
1	A	127	ASP	14.2
1	A	119	ARG	13.6
1	A	120	MET	13.5
1	A	40	ASN	13.4
1	A	81	ASN	13.4
1	A	150	ILE	13.3
1	A	163	ASN	13.2
1	A	99	LEU	13.1
1	A	83	LYS	13.1
1	A	80	ARG	12.8
1	A	85	LYS	12.7
1	A	79	LEU	12.6
1	A	53	ASN	12.6
1	A	4	PHE	12.5
1	A	56	GLY	12.5
1	A	44	SER	12.5
1	A	134	ALA	12.5
1	A	138	TRP	12.3
1	A	122	GLN	12.3
1	A	94	VAL	12.2
1	A	87	VAL	12.1
1	A	123	GLN	12.1
1	A	144	ASN	12.1
1	A	9	ILE	12.0
1	A	139	TYR	11.8
1	A	45	GLU	11.8

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Mol	Chain	Res	Type	RSRZ
1	A	135	LYS	11.8
1	A	128	GLU	11.8
1	A	95	ARG	11.6
1	A	59	THR	11.5
1	A	113	GLY	11.5
1	A	100	ILE	11.2
1	A	16	LYS	11.1
1	A	42	ALA	11.0
1	A	13	LEU	10.8
1	A	91	LEU	10.6
1	A	55	ASN	10.5
1	A	148	ARG	10.5
1	A	158	TRP	10.5
1	A	20	ASP	10.4
1	A	104	PHE	10.4
1	A	101	ASN	10.2
1	A	132	ASN	10.2
1	A	133	LEU	10.1
1	A	125	ARG	9.9
1	A	88	TYR	9.8
1	A	67	PHE	9.5
1	A	162	LYS	9.4
1	A	108	GLU	9.2
1	A	73	ALA	9.1
1	A	19	LYS	9.0
1	A	7	LEU	9.0
1	A	107	GLY	8.9
1	A	152	THR	8.7
1	A	143	PRO	8.6
1	A	6	MET	8.6
1	A	29	ILE	8.6
1	A	90	SER	8.5
1	A	2	ASN	8.4
1	A	74	ALA	8.4
1	A	145	ARG	8.4
1	A	64	GLU	8.2
1	A	28	GLY	8.2
1	A	155	THR	8.2
1	A	63	ALA	8.1
1	A	146	ALA	7.9
1	A	110	GLY	7.9
1	A	105	GLN	7.8

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Mol	Chain	Res	Type	RSRZ
1	A	72	ASP	7.8
1	A	156	GLY	7.7
1	A	106	MET	7.7
1	A	3	ILE	7.5
1	A	89	ASP	7.3
1	A	154	ARG	7.2
1	A	50	ILE	7.2
1	A	23	GLY	7.2
1	A	66	LEU	7.2
1	A	60	LYS	7.1
1	A	70	ASP	7.1
1	A	77	GLY	7.0
1	A	161	TYR	7.0
1	A	1	MET	6.9
1	A	46	LEU	6.7
1	A	93	ALA	6.7
1	A	96	ARG	6.6
1	A	92	ASP	6.6
1	A	76	ARG	6.5
1	A	124	LYS	6.5
1	A	47	ASP	6.4
1	A	159	ASP	6.3
1	A	65	LYS	6.1
1	A	151	THR	5.9
1	A	11	GLU	5.9
1	A	141	GLN	5.7
1	A	69	GLN	5.6
1	A	68	ASN	5.5
1	A	160	ALA	5.4
1	A	61	ASP	5.3
1	A	8	ARG	5.0
1	A	137	ARG	4.9
1	A	22	GLU	4.8
1	A	157	SER	4.6
1	A	5	GLU	4.0
1	A	62	GLU	3.8
1	A	31	HIS	3.4
1	A	10	ASP	3.3
1	A	147	LYS	3.3
1	A	21	THR	3.1
1	A	30	GLY	2.4

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.